

Policy & Procedure (P&P)

Policy Title :

NEONATAL TESTING AND BLOOD TRANSFUSION

Department	Index No.	Scope
Laboratory & Blood Bank	LAB-080	All Blood Bank Staff , All medical staff
Issue Date	Revision NO	Effective Date
1441/7/14	NEW	1441/7/19
Review Due Date	Related Standard NO.	Page Number#
1443/7/19	CBAHI (LB.66)	9

01. Policy:

The blood bank has a process how to test and to select the suitable units of blood for the neonate.

02. Definition :

N/A

03. Purpose :

To provide a safe and compatible blood to the neonate.

04. Procedure :

NEONATAL TESTING AND BLOOD TRANSFUSION

Compatibility Testing

AABB Standards allows limited pretransfusion serologic testing for infants younger than 4 months

Initial patient testing must include ABO and D typing of the patients' red cells and screening for unexpected red cell antibodies using either plasma or serum from the infant or mother.

Make sure if the sample was collected from the cord blood, then the blood bank technician will wash the Red blood cells 3 times before performing the blood grouping.

During any hospitalization, crossmatch-compatibility testing and repeat ABO and D typing need not be conducted as long as all of the following criteria are met:

- 1) the antibody screening result is negative;

2) transfused RBCs are group O, ABO identical, or ABO compatible;

3) transfused cells are either D negative or the same D type as the patient.

Testing the infant's reverse type for anti-A and/or anti-B is not necessary.

However, before non-group O RBCs can be issued, testing of the infant's plasma or serum is required to detect passively acquired maternal anti-A or anti-B and should include antiglobulin phase.

If the antibody is present, ABO-compatible RBCs must be transfused until the acquired antibody is no longer detected.

If an unexpected non-ABO alloantibody is detected in the infant's or mother's specimen, the infant must be transfused with RBC units lacking the corresponding antigen(s) or units that are compatible by antiglobulin crossmatch.

This regimen should continue until the maternal antibody is no longer detected in the infant's plasma or serum.

Once a negative antibody screening result is obtained, crossmatches and use of antigen- negative blood are no longer required for infants younger than 4 months because of their immature immunologic status.

Multiple observational studies have shown that alloimmunization to red cell antigens is rare during the neonatal period.

For this reason, repeated typing and screening, which are required for adults and children older than 4 months, is unnecessary in younger infants and contributes to significant iatrogenic blood loss.

Also, the transfusion service should avoid transfusing any components that may passively transfer unexpected alloantibodies or ABO-incompatible antibodies to recipients.

The direct coombs test: DAT

The AABB, in the Standards for Blood Banks and Transfusion Services doesn't requires a DAT or an autologous control (auto control) as part of pretransfusion testing.

It is indicated in:

- Hemolytic disease of newborns (HDN)
- Auto immune hemolytic anemia
- Transfusion reaction

According to the AABB the Standards, DAT will be performed on:

- All cord blood samples
- All Transfusion reaction
- Blood samples which show positive auto control

Selection of blood Components for Neonatal Transfusion

Aliquoting for Small-Volume Transfusion

The purpose of creating small-volume aliquots is to limit donor exposures, prevent circulatory overload, and potentially decrease donor related risks.

Several technical approaches can be used to accomplish these goals and minimize blood wastage.

Small-volume RBC transfusion aliquots are commonly made with a multiple-pack system.

Hospital transfusion services that have a sterile connection device have multiple additional options to produce aliquots, such as baby transfer packs, small-volume bags, or tubing with integrally attached syringes.

In Alqunfudah General hospital blood bank department, the sterile connection device is available: WELDER.

Once the blood bank technician receives the crossmatching request from the nursery department, he will perform the crossmatching tests and if the unit is compatible, he will connect the original bag to the baby transfer bag using the sterile connection device: the WELDER machine and withdraws only the amount of blood requested by the doctor.

Then the blood bank technician will label the unit of blood with the same label as the original bag with the same expiry date.

The remaining blood in the original bag can be aliquoted in other small bags with the same amount of blood if the baby needs more transfusions and each of the smaller units has the same expiration date as the original unit because the system's original seal has remained intact and a "closed system" is maintained or the unit can be transfused to another patient.

RBC Additive Solutions

Historically, transfused RBCs for children contained CPDA-1 anticoagulant-preservative solution.

However, as ASs evolved to extend the shelf life of RBCs, many experts began to question their safety in neonates.

However, for infants with renal or hepatic insufficiency, it is recommended that AS solution be removed from RBC units, particularly if multiple transfusions from the same unit are expected.

The safety of AS-preserved RBCs in trauma-related massive transfusions, cardiac surgery, or exchange transfusions is unknown in this population. Therefore, AS-preserved RBC units should be used with caution in these settings.

RBC Age

For neonates, the blood bank technician will choose units of PRBCs with the age less than 10 days.

Blood components and dosing of small volumes (AABB)

< 14 days
+ sickle cell
Negative
+ LeuKodepleted.

TABLE 23-2. Blood Components and Dosing of Small Volumes in Neonatal and Pediatric Patients⁴⁹

Component	Dose	Expected Increment
Red Blood Cells	10-15 mL/kg	Hemoglobin increase 2-3 g/dL *
Fresh Frozen Plasma	10-15 mL/kg	15%-20% rise in factor levels (assuming 100% recovery)
Platelets [whole-blood-derived (WBD) or apheresis]	5-10 mL/kg or 1 WBD unit/10 kg (patients ≥ 10 kg)	50,000/ μ L rise in platelet count (assuming 100% recovery) [†]
Cryoprecipitated AHF	1-2 units/10 kg	60-100 mg/dL rise in fibrinogen (assuming 100% recovery)

* Dependent on anticoagulant-preservative solution: with 3 g/dL increment for CPD and CPDA-1 and 2 g/dL for AS-1, AS-3, and AS-5.

[†] Assumes $\geq 5.5 \times 10^{10}$ platelets in 50 mL of plasma (whole-blood-derived) and $\geq 3.0 \times 10^{11}$ platelets in 250-300 mL plasma (apheresis).

CPD = citrate-phosphate-dextrose; CPDA-1 = citrate-phosphate-dextrose-adenine-1; AS = additive solution.

Selection of transfused RBCs blood groups according to the maternal blood group

Infant	Mom	Transfused Blood	prbc/whole blood
O (Ag ₀)	O (anti A and anti B) A (anti B) B (anti A)	O O O	W/PRbc
A (Ag A)	O (anti A and anti B) A (anti B) B (anti A) AB (0 Ab)	O A O A	PRbc W/PRbc PRbc W/PRbc
B (Ag B)	O (anti A and anti B) A (anti B) B (anti A) AB (0 Ab)	O O B B	PRbc PRbc W/PRbc W/PRbc
AB (Ag A + Ag B)	A (anti B) B (anti A) AB (0 Ab) AB (0 Ab)	A B AB A/B/O	W/PRbc W/PRbc W/PRbc PRbc

Indications for Red Cell Transfusion (AABB)

TABLE 23-1. Transfusion Guidelines for RBCs in Infants Younger than 4 Months^{23,26}

1.	Hematocrit <20% with low reticulocyte count and symptomatic anemia (tachycardia, tachypnea, poor feeding).
2.	Hematocrit <30% and any of the following:
a.	On <35% oxygen hood.
b.	On oxygen by nasal cannula.
c.	On continuous positive airway pressure and/or intermittent mandatory ventilation on mechanical ventilation with mean airway pressure <6 cm of water.
d.	With significant tachycardia or tachypnea (heart rate >180 beats/minute for 24 hours, respiratory rate >80 beats/minute for 24 hours).
e.	With significant apnea or bradycardia (>6 episodes in 12 hours or 2 episodes in 24 hours requiring bag and mask ventilation while receiving therapeutic doses of methylxanthines).
f.	With low weight gain (<10 g/day observed over 4 days while receiving ≥ 100 kcal/kg/day).
3.	Hematocrit <35% and either of the following:
a.	On >35% oxygen hood.
b.	On continuous positive airway pressure/intermittent mandatory ventilation with mean airway pressure ≥ 6-8 cm of water.
4.	Hematocrit <45% and either of the following:
a.	On extracorporeal membrane oxygenation.
b.	With congenital cyanotic heart disease.

Exchange Transfusion for Hyperbilirubinemia

Exchange transfusion in neonates involves replacement of one or two whole-blood volumes.

The primary purpose of this therapy is to treat excessively high levels of unconjugated bilirubin (hyperbilirubinemia).

In high concentrations, bilirubin may cross the blood brain barrier; concentrate in the basal ganglia and cerebellum of preterm and full-term infants; and cause irreversible damage, known as "kernicterus," to the central nervous system.



وزارة الصحة Ministry of Health مستشفى القنفذة العام

Phototherapy (use of fluorescent ultraviolet lights) is the current treatment of choice for hyperbilirubinemia; exchange transfusion is reserved for patients who fail phototherapy.

A double-volume exchange transfusion (two 85-mL/kg transfusions for full-term infants and two 100-mL/kg transfusions for VLBW infants) removes approximately 70% to 90% of the circulating red cells and approximately 50% of the total bilirubin.

However, after the first exchange transfusion, bilirubin levels may rise again because of a re-equilibration of the extravascular tissue and plasma bilirubin, which may necessitate another exchange transfusion.

Occasionally, exchange transfusion is used to eliminate toxins, drugs, or chemicals administered to the mother near the time of delivery.

Exchange transfusion is also used when toxic doses have been administered to the infant or accumulate at high levels in the infant as a result of prematurity and/or an inborn error of metabolism.

Exchange Transfusion

COMPONENT CHOICE AND PHYSIOLOGIC EFFECTS.

Typically, RBCs are resuspended in ABO-compatible thawed Fresh Frozen Plasma (FFP) for an exchange transfusion. Most often, RBCs < 7 days old and stored in CPDA-1 are used to avoid high levels of potassium and to maximize red cell survival.

When using ASRBC units, some blood banks elect to remove the additive-containing plasma to reduce the volume transfused.

Most transfusion services provide RBC units that are hemoglobin S negative, cytomegalovirus (CMV) reduced-risk (leukocyte reduced and/or CMV seronegative), and irradiated.

Irradiation should be performed just before the exchange to prevent potentiation of the potassium storage lesion.

Some experts recommend washing or removing the supernatant of red cells that have been irradiated to avoid the complications of hyperkalemic cardiac arrhythmias.

VASCULAR ACCESS.

Umbilical venous catheters are used for exchange transfusions in preterm and full-term infants just after birth.

If umbilical venous catheters are not available, small saphenous catheters may be used.

Transfusion guidelines for platelets in neonates

TABLE 23-3. Transfusion Guidelines for Platelets in Neonates and Older Children^{23,26}

With Thrombocytopenia
1. Platelet count 5,000 to 10,000/ μ L with failure of platelet production.
2. Platelet count <30,000/ μ L in neonate with failure of platelet production.
3. Platelet count <50,000/ μ L in stable premature infant:
a. With active bleeding, or
b. Before an invasive procedure, with failure of platelet production.
4. Platelet count <100,000/ μ L in sick premature infant:
a. With active bleeding, or
b. Before an invasive procedure in patient with DIC.
Without Thrombocytopenia
1. Active bleeding in association with qualitative platelet defect.
2. Unexplained excessive bleeding in a patient undergoing cardiopulmonary bypass.
3. Patient undergoing ECMO with:
a. A platelet count of <100,000/ μ L, or
b. Higher platelet counts and bleeding.

DIC = disseminated intravascular coagulation; ECMO = extracorporeal membrane oxygenation.

Transfusion guidelines for plasma products in neonates

TABLE 23-5. Transfusion Guidelines for Plasma Products in Neonates and Older Children^{23,26}

Fresh Frozen Plasma (FFP)
1. Support during treatment of disseminated intravascular dissemination.
2. Replacement therapy:
a. When specific factor concentrates are not available, including, but not limited to, antithrombin; protein C or S deficiency; and Factor II, Factor V, Factor X, and Factor XI deficiencies.
b. During therapeutic plasma exchange when FFP is indicated (cryopoor plasma, plasma from which the cryoprecipitate has been removed).
3. Reversal of warfarin in an emergency situation, such as before an invasive procedure with active bleeding.
Note: FFP is not indicated for volume expansion or enhancement of wound healing.
Cryoprecipitated AHF
1. Hypofibrinogenemia or dysfibrinogenemia with active bleeding.
2. Hypofibrinogenemia or dysfibrinogenemia while undergoing an invasive procedure.
3. Factor XIII deficiency with active bleeding or while undergoing an invasive procedure in the absence of Factor XIII concentrate.
4. Limited directed-donor cryoprecipitate for bleeding episodes in small children with hemophilia A (when recombinant and plasma-derived Factor VIII products are not available).
5. In the preparation of fibrin sealant.
6. von Willebrand disease with active bleeding, but only when both of the following are true:
a. Deamino-D-arginine vasopressin (DDAVP) is contraindicated, not available, or does not elicit response.
b. Virus-inactivated plasma-derived Factor VIII concentrate (which contains von Willebrand factor) is not available.

Transfusion guidelines for irradiated blood for the neonates (aabb, 2014)

TABLE 23-9. Irradiation Guidelines for Neonates and Older Children Who Require Cellular Blood Components^{23,26}

1. Premature infants weighing <1200 g at birth.
2. Any patient with:
a. Known or suspected cellular immune deficiency.
b. Significant immunosuppression related to chemotherapy or radiation treatment.
3. Any patient receiving:
a. Components from blood relatives.
b. HLA-matched or crossmatched platelet components.

- Premature infants weighing < 1200 g at birth
- Any patient with :
Known or suspected cellular immune deficiency
Significant immunosuppression related to chemotherapy or radiation treatment
- Any patient receiving:
Components from relatives
HLA matched or crossmatched platelet components

05. Responsibilities :

All Blood Bank Staff of Al-Qunfudah General Hospital.

All medical staff

06. Equipment & Forms

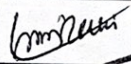
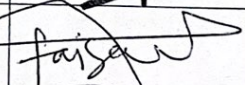
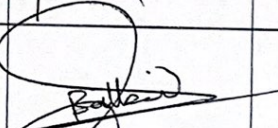
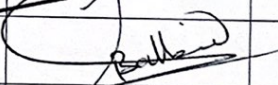
07. Attachment :

N/A

08. Reference

Technical Manual of the American Association of Blood Banks, 18 th edition
AABB neonatal transfusion guidance 2012

Preparation , Reviewing & Approval Box

	NAME	POSITION	SIGN & STAMP	DATE
Prepared By	Dr RAJA NACER SASSI	Head of Blood Bank		15/7/1441
Reviewed By	Dr IBRAHIM AWADH	Lab & B.Bank HOD		15/7/1441
Document Reviewed By	Dr FAISAL FALATA	TQM Director		15/7/1441
Approved By	Dr. AHMAD BALBEED	Chairman of blood utilization committee		
Approved By	Dr AHMAD BALBAID	Medical Director		
Approved By	Mr HASSAN ALNASHERI	Hospital Director		11/3/2020

